**Center Independent Research & Development: GSFC IRAD**

# Pioneering New Filters for X-ray Astrophysics

Completed Technology Project (2012 - 2014)

## Project Introduction

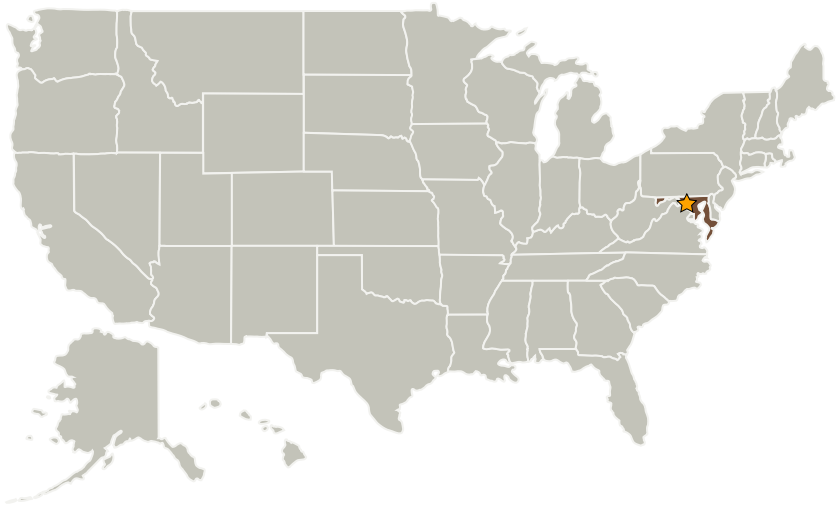
The x-ray microcalorimeter is fundamentally a thermal sensor and as such is sensitive to all forms of electromagnetic and particle radiation. To optimize such a device for use as an x-ray spectrometer, it is therefore necessary to block all forms of radiation that are not in the x-ray energy band (typically 0.1-10 keV). If not blocked, radiation with energy lower than the x-ray band would contribute numerous, un-resolved photons, thereby adding noise and degrade the energy resolution. This requirement has been generally solved by placing a series of thin metalized films between the sensor and the outside world of the instrument. The problem is, in order to manufacture films thick enough to be robust, the transmission in the lower energy part of the x-ray band almost lost. To get around this problem, we propose a completely new type of x-ray filter that will have a net transmission efficiency of ~ 40 - 60% all across the soft x-ray band between 0.1 and 1.0 keV, which will provide up to a 100-fold increase in soft x-ray transmission in this energy band over existing filters.

We plan to produce filters with holes so small that longer wavelength photons are unable to propagate through, whereas the shorter wavelength x-ray photons simply pass through the holes unimpeded. This type of filter is called a "grill filter" and the desired functionality is possible due to the large separation in frequency between the block and pass bands.

## Anticipated Benefits

N/A

## Primary U.S. Work Locations and Key Partners




Pioneering New Filters for X-ray Astrophysics

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| Organizations Performing Work | Role | Type | Location |
|---|---|---|---|
| ★Goddard Space Flight Center(GSFC) | Lead Organization | NASA Center | Greenbelt, Maryland |

| Primary U.S. Work Locations |
|---|
| Maryland |

### Project Website:

http://sciences.gsfc.nasa.gov/sed/

## Organizational Responsibility

**Responsible Mission Directorate:**

Mission Support Directorate (MSD)

**Lead Center / Facility:**

Goddard Space Flight Center (GSFC)

**Responsible Program:**

Center Independent Research & Development: GSFC IRAD

## Project Management

**Program Manager:**

Peter M Hughes

**Project Manager:**

Stanley D Hunter

**Principal Investigator:**

Richard L Kelley

**Co-Investigator:**

James A Chervenak

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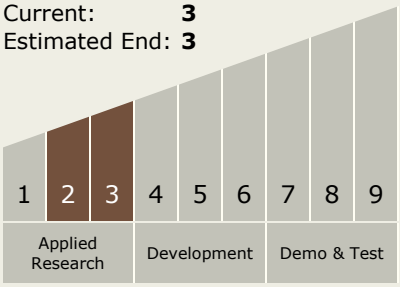
## Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**




## Technology Areas

**Primary:**

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.1 Detectors and Focal Planes